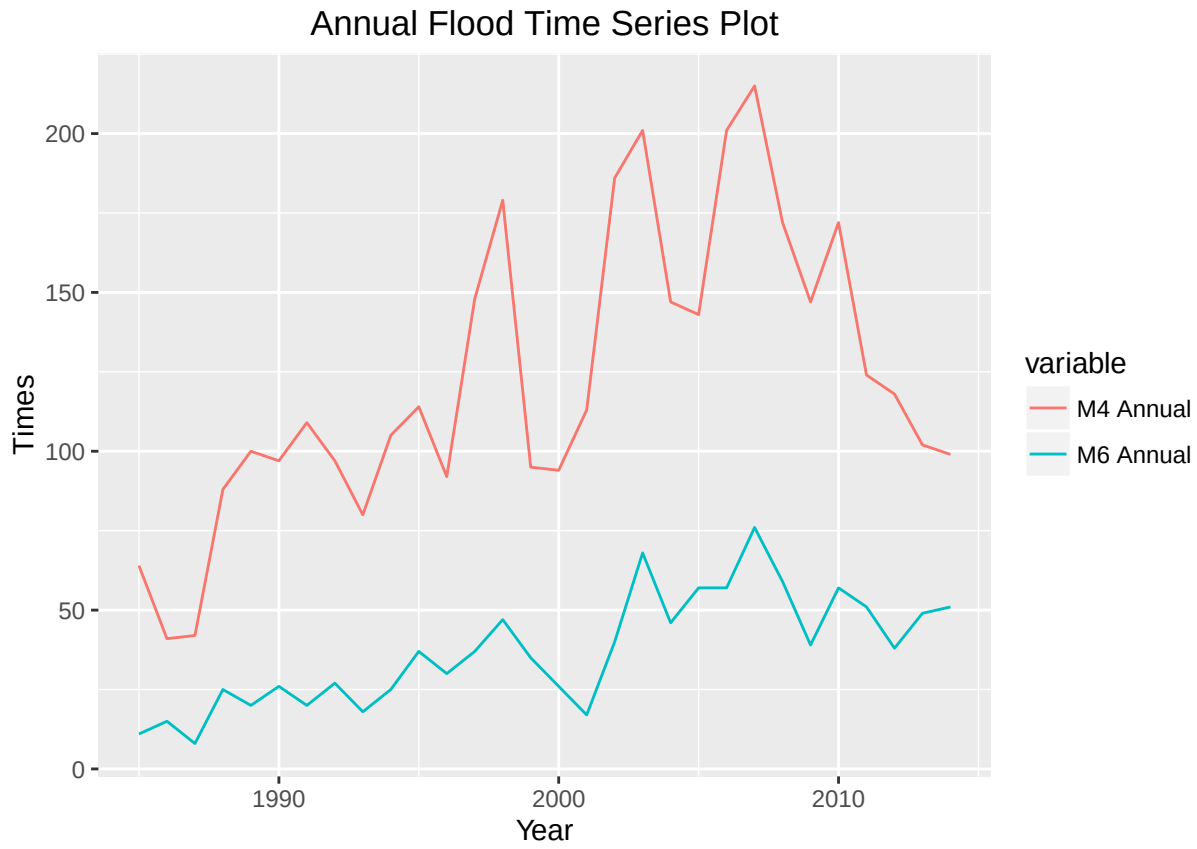
Proj2

ggMonet

March 3, 2016

```
############################
#      Global Setup        #
############################

setwd("C:/Columbia Courses/Visualization/Project2")


############################
#  Plots about Flood Stats  #
############################
stat = read.csv("GlobalFloodsRecordAnalyses.csv", as.is = TRUE)

# Time series plot of annual floods --Xuyan
library(ggplot2)
library(reshape2)
names(stat) = c("Year","M4 Cumulative", "M6 Cumulative", "M4 Annual", "M6 Annual")
floodAnnual = melt(stat[-(2:3)], id.vars = "Year", value.name = "Times")
ggplot(floodAnnual, aes(Year,Times)) + geom_line(aes(color = variable)) +
  ggtitle("Annual Flood Time Series Plot")
```



TODO 1, scale of the plots and some more variables, and heatmap without geographical info

all plots in ggplot style

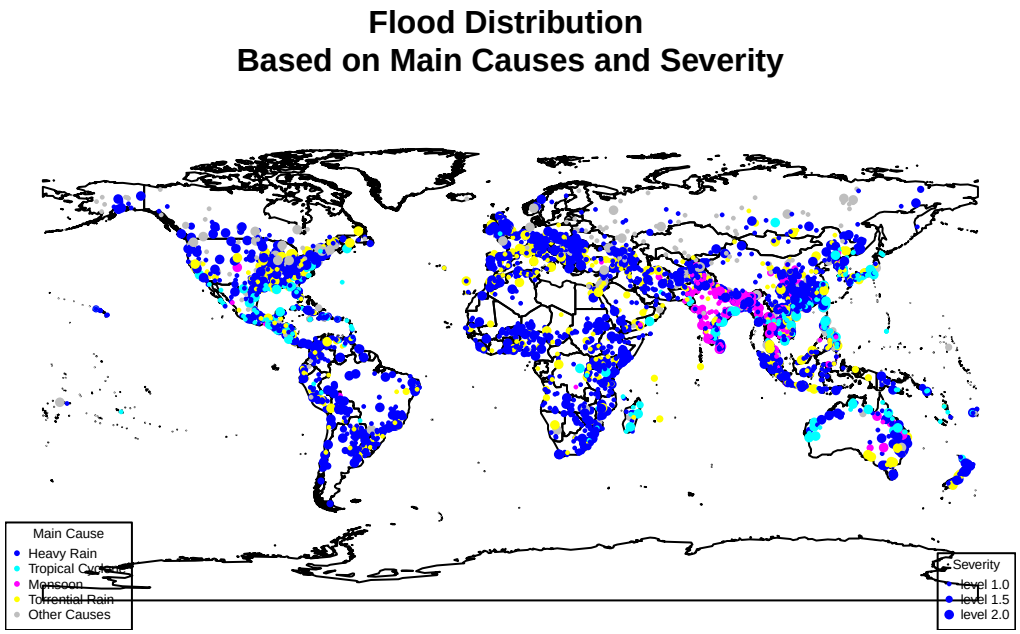
Tian and Xiyue

```
#####################################
# Plots about Flood Master --Global #
#####################################
master = read.csv("GlobalFloodsRecordMaster.csv", as.is = TRUE)

library(fields)
library(maptools)
library(ggplot2)
library(ggmap)
library(maps)
library(plyr)
library(lattice)
library(Rmisc)
library(mapproj)
library(rgbif)


# data manipulation --Tian
df = master
df$Centroid.X <- as.numeric(df$Centroid.X)
df$Centroid.Y <- as.numeric(df$Centroid.Y)
df$Severity..<- as.numeric(df$Severity..)
class(df$Centroid.X[1])
```

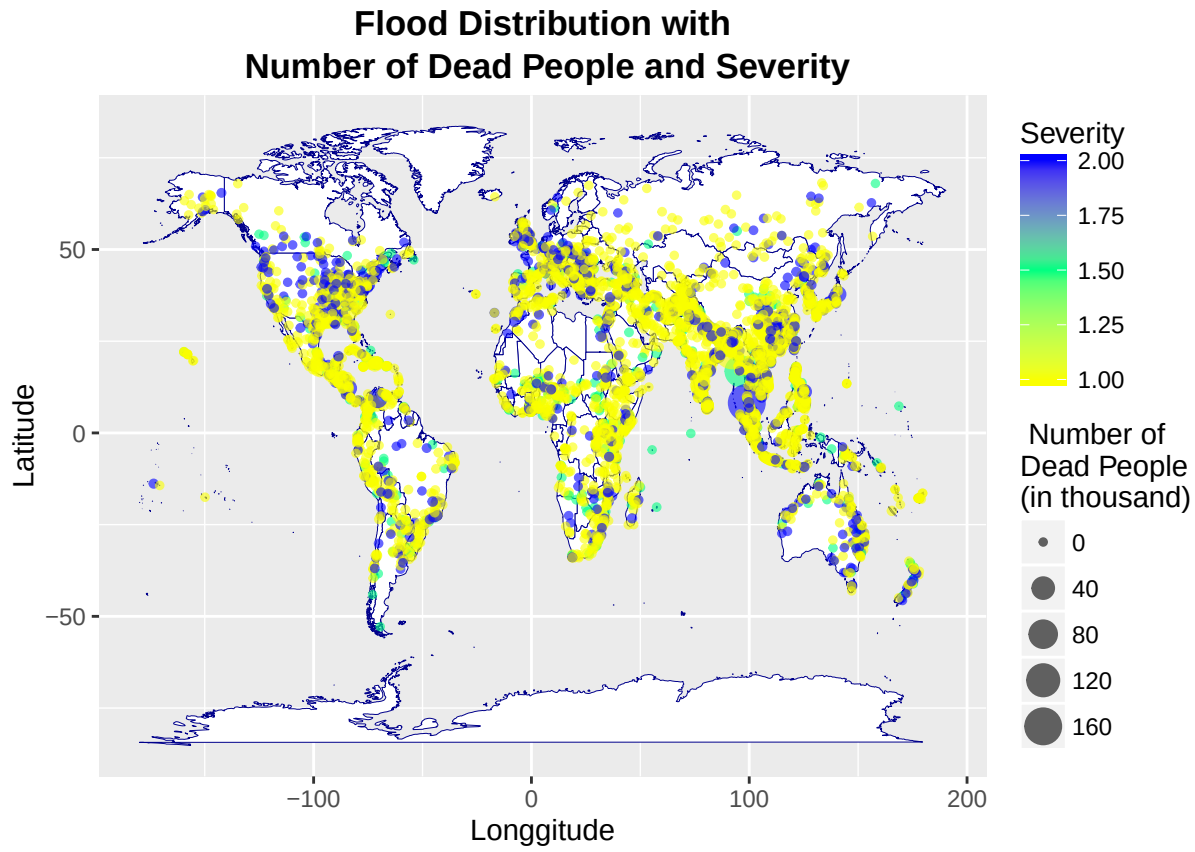
```
## [1] "numeric"
```

```
df <- df[-which(is.na(df$Centroid.X)),]
XLon <- as.numeric(df$Centroid.X)
YLat <- as.numeric(df$Centroid.Y)
Z <- as.numeric(df$Severity..)
Cause <- df$Main.cause
#rev(sort(table(Cause)))[1:6]
n <- length(Cause)
for (i in 1:n){
  if (grepl('eavy',Cause[i])){Cause[i] <- replace(Cause[i], grepl('eavy',Cause[i]),1) }
  #1 stands for 'Heavy Rain'
  else if(grepl('clone',Cause[i])){Cause[i] <- replace(Cause[i], grepl('clone',Cause[i]),2)}
  #2 stands for'Tropical Cyclone'
  else if(grepl('onsoon',Cause[i])){Cause[i] <- replace(Cause[i], grepl('onsoon',Cause[i]),3)}
  #3 stands for 'Monsoon'
  else if(grepl('orrential',Cause[i])){Cause[i] <- replace(Cause[i], grepl('orrential',Cause[i]),4)}
  #4 stands for 'Torrential Rain'
  else {Cause[i] <- replace(Cause[i],TRUE,5)}
```

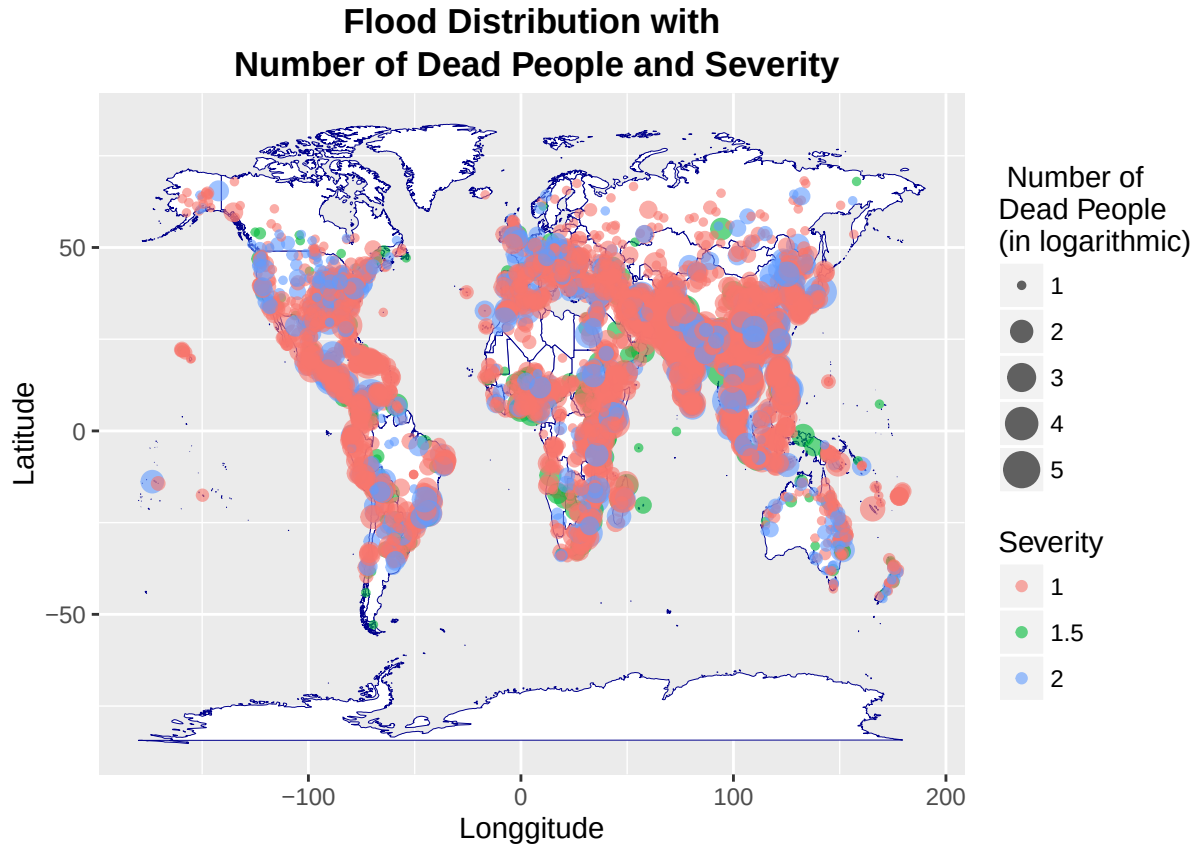
```
  #5 stands for 'Other Causes'
}

#Try simple plot of "Main Causes" and "Severity": --Tian
data(wrld_simpl)
plot(wrld_simpl)
points(XLon, YLat, pch = 16, cex = Z/3, col = as.numeric(Cause)+3)
title(main = "Flood Distribution \nBased on Main Causes and Severity", cex.main =1)
legend("bottomleft",legend = c("Heavy Rain","Tropical Cyclone","Monsoon","Torrential Rain","Other Causes
       cex = 0.4, pch = 16, col = c(4:8), title ="Main Cause",title.adj = .5)
legend("bottomright",legend = c("level 1.0","level 1.5","level 2.0"),
       pt.cex = c(1,1.5,2)/3, cex = .4, pch = 16,col =4, title = "Severity")
```



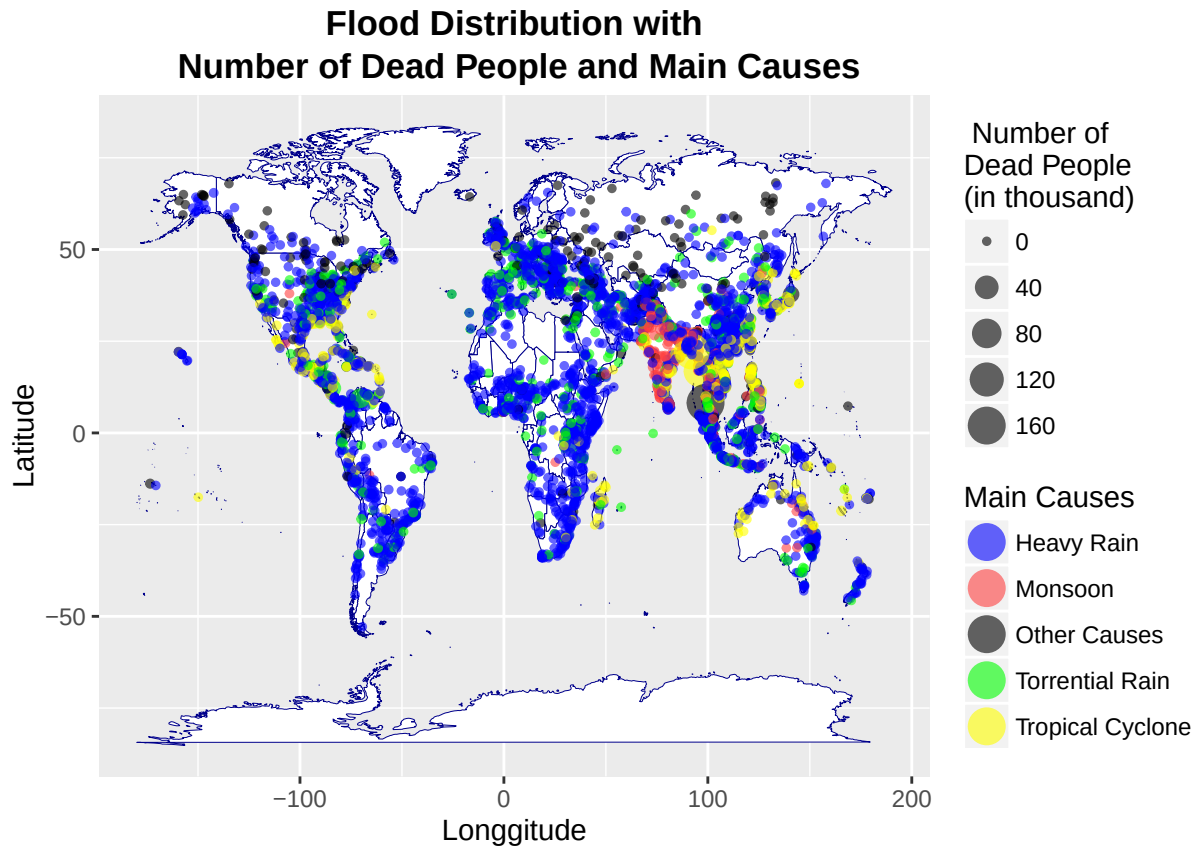

```
#Try ggplot of "Number of Dead People" and "Severity" --Tian
Dead <- as.numeric(df$Dead)
df_new <- data.frame(XLon,YLat,Z,Dead)

world <- map_data("world")
ggplot(world, aes(long, lat)) +
  geom_polygon(aes(group=group), fill = "White", color ="Dark Blue", size = 0.05) +
  geom_jitter(data=df_new, aes(XLon, YLat, color = Z, size = Dead/1000), alpha = 0.6) +
  scale_colour_gradientn(colours = rainbow(3, start = 0.17, alpha = 0.2)) +
  labs(title = "Flood Distribution with\n Number of Dead People and Severity", x = "Longgitude",
       y = "Latitude", size = " Number of\nDead People\n(in thousand)", color = "Severity")+
  theme(plot.title = element_text(lineheight=1, face="bold"))
```



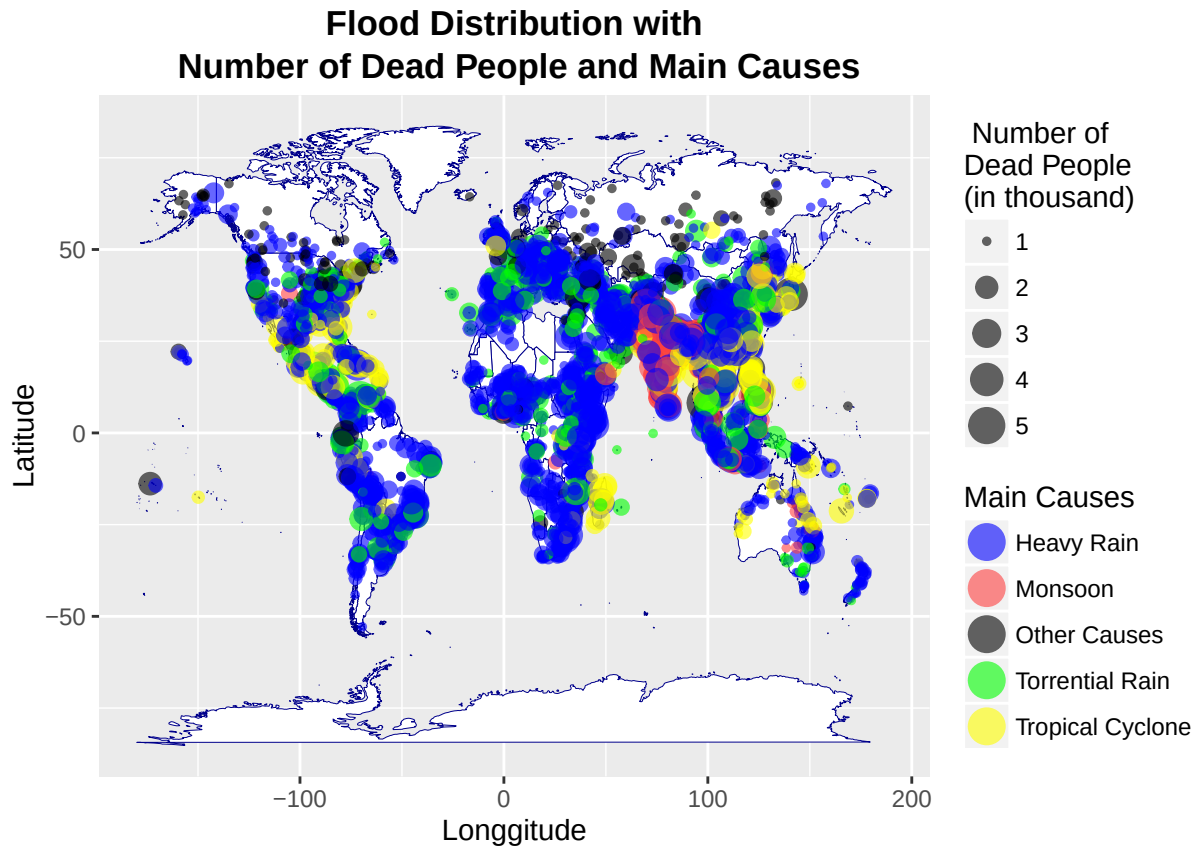

```
#Try ggplot of "Number of Dead People" and "Severity" another version --Xuyan
# severity as factor and logarithmic dead
Dead <- as.numeric(df$Dead)
df_new <- data.frame(XLon,YLat,Z,Dead)

df_new$Z = as.factor(df_new$Z)
world <- map_data("world")
ggplot(world, aes(long, lat)) +
  geom_polygon(aes(group=group), fill = "White", color ="Dark Blue", size = 0.05) +
  geom_jitter(data=df_new, aes(XLon, YLat, color = Z, size = log(Dead+10,10)), alpha = 0.6) +
  # scale_colour_gradientn(colours = rainbow(3, start = 0.17, alpha = 0.2)) +
  labs(title = "Flood Distribution with\n Number of Dead People and Severity", x = "Longgitude",
       y = "Latitude", size = " Number of\nDead People\n(in logarithmic)", color = "Severity")+
  theme(plot.title = element_text(lineheight=1, face="bold"))
```




```
#Try ggplot of "Number of Dead People" and "Main Causes" --Tian
for (i in 1:n){
  Cause[i] <- replace(Cause[i], Cause[i]=='1','Heavy Rain')
  Cause[i] <- replace(Cause[i], Cause[i]=='2','Tropical Cyclone')
  Cause[i] <- replace(Cause[i], Cause[i]=='3','Monsoon')
  Cause[i] <- replace(Cause[i], Cause[i]=='4','Torrential Rain')
  Cause[i] <- replace(Cause[i], Cause[i]=='5','Other Causes')
}
df_new2 <- data.frame(XLon,YLat,Cause,Dead)
ggplot(world, aes(long, lat)) +
  geom_polygon(aes(group=group), fill = "White", color ="Dark Blue", size = 0.05) +
  geom_jitter(data=df_new2, aes(XLon, YLat, color = Cause, size = Dead/1000), alpha = 0.6) +
  scale_colour_manual(values = c("blue","brown1","black","green","yellow"))+
  labs(title = "Flood Distribution with\n Number of Dead People and Main Causes", x = "Longgitude",
       y = "Latitude", size = " Number of\nDead People\n(in thousand)", color = "Main Causes")+
  guides(colour = guide_legend(override.aes = list(size=6)))+
  theme(plot.title = element_text(lineheight=1, face="bold"))
```




```
#Try ggplot of "Number of Dead People" and "Main Causes" --Xuyan
for (i in 1:n){
  Cause[i] <- replace(Cause[i], Cause[i]=='1','Heavy Rain')
  Cause[i] <- replace(Cause[i], Cause[i]=='2','Tropical Cyclone')
  Cause[i] <- replace(Cause[i], Cause[i]=='3','Monsoon')
  Cause[i] <- replace(Cause[i], Cause[i]=='4','Torrential Rain')
  Cause[i] <- replace(Cause[i], Cause[i]=='5','Other Causes')
}
df_new2 <- data.frame(XLon,YLat,Cause,Dead)
ggplot(world, aes(long, lat)) +
  geom_polygon(aes(group=group), fill = "White", color ="Dark Blue", size = 0.05) +
  geom_jitter(data=df_new2, aes(XLon, YLat, color = Cause, size = log(Dead+10,10)), alpha = 0.6) +
  scale_colour_manual(values = c("blue","brown1","black","green","yellow"))+
  labs(title = "Flood Distribution with\n Number of Dead People and Main Causes", x = "Longgitude",
       y = "Latitude", size = " Number of\nDead People\n(in thousand)", color = "Main Causes")+
  guides(colour = guide_legend(override.aes = list(size=6)))+
  theme(plot.title = element_text(lineheight=1, face="bold"))
```

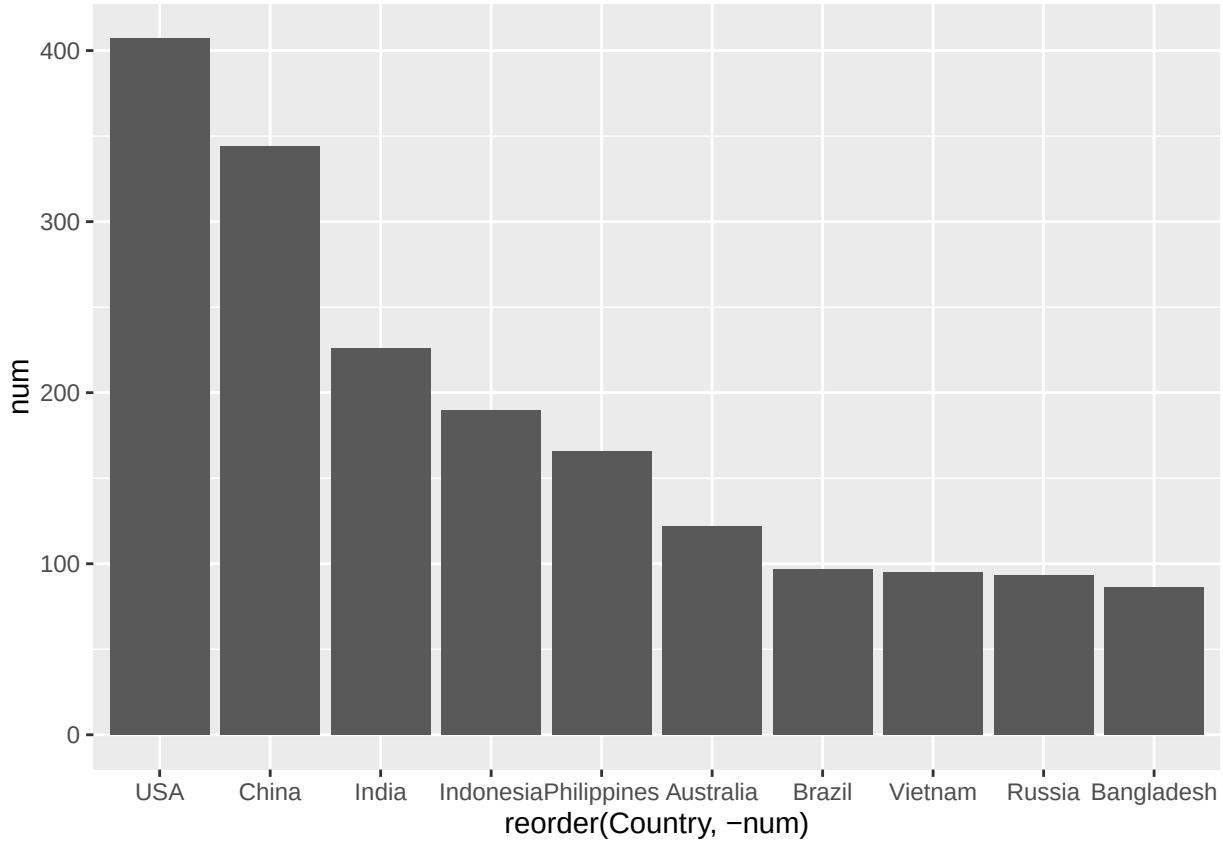


TODO 2, more plots on the distribution of countries ie density

Xuyan

```
############################
#  Reason for Local Plots #
############################

# country_cleansing

country = master
country$Dead = as.numeric(country$Dead)
country = country[!is.na(country$Dead),]

country$Country = gsub("[?]","",country$Country)
country$Country = gsub("[/]","",country$Country)
country$Country = gsub("^ ","",country$Country)
country$Country = gsub(" $","",country$Country)
country$Country[country$Country == "USA."] = "USA"


library(dplyr)
country_group = group_by(country,Country)
```

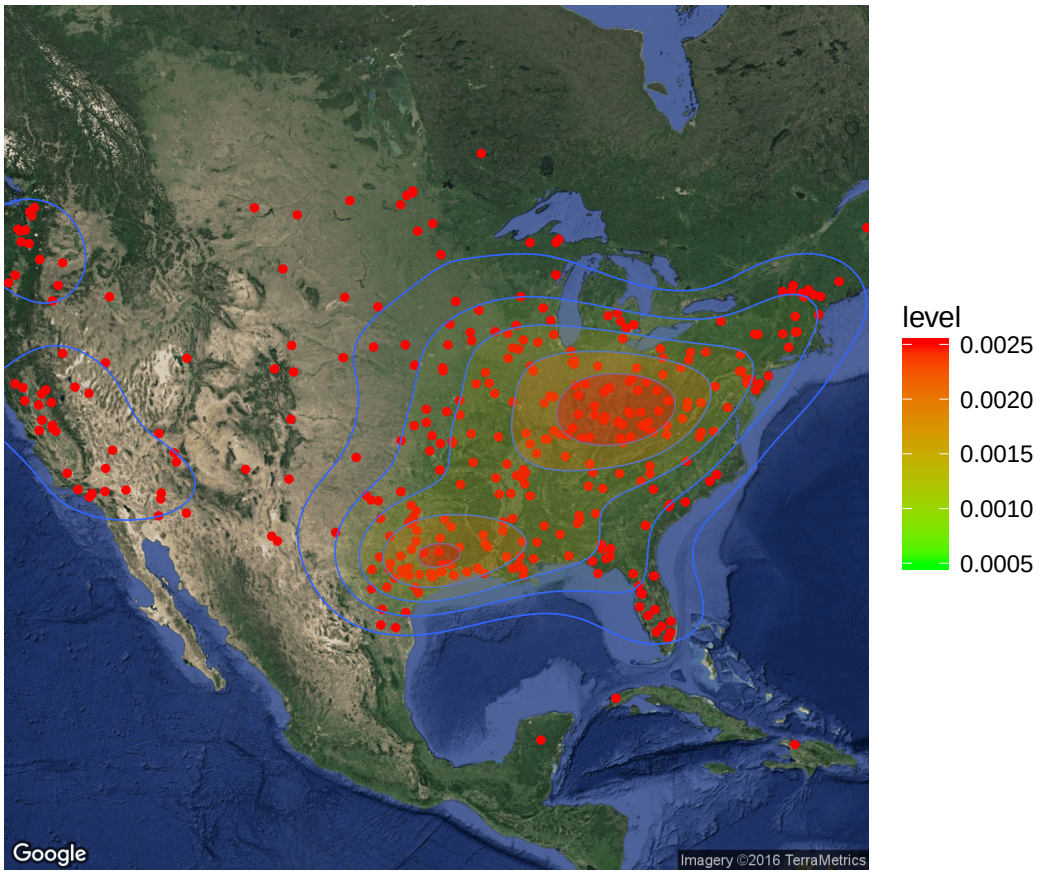
```
country_summary = summarize(country_group, num = n(), dead = sum(Dead))
country_summary = as.data.frame(country_summary[order(country_summary$num,decreasing=T),])

ggplot(country_summary[1:10,],aes(reorder(Country,-num),num))+geom_bar(stat = "identity")
```




```
#List the top3 countries
```

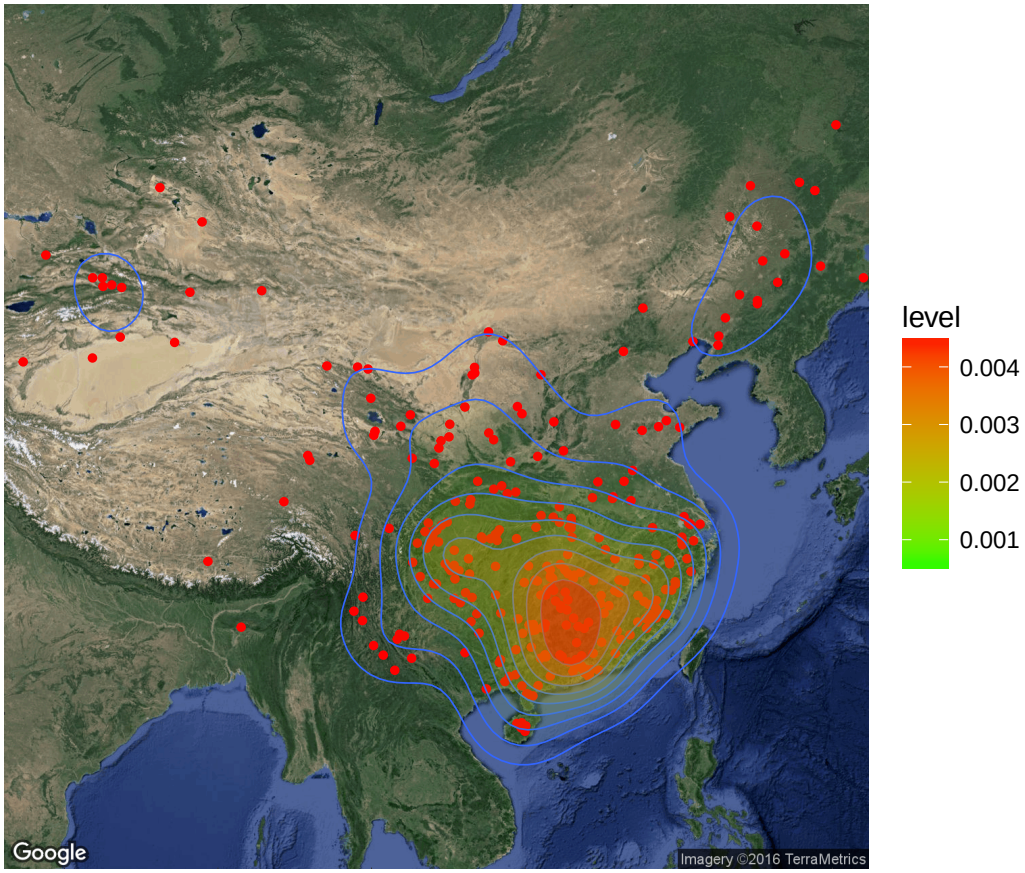
```
#######################################
#  Plots about Flood Master --Local #
#######################################
# -- Hiro

master_f = data.frame(master)


# information of USA


## getting info of usa
usa_master = master_f[master_f$Country == "USA", ]

## getting map of usa
map_usa <- get_map(location = "usa", maptype = "satellite", zoom = 4)
```

```
## Showing which area had floods in the past
usa_master_heat = data.frame(Centroid.X=as.numeric(usa_master$Centroid.X),
                             Centroid.Y=as.numeric(usa_master$Centroid.Y),
                             Total.floods.M.4=usa_master$Total.floods.M.4)

ggmap(map_usa, extent = "device") +
  geom_point(aes(x=usa_master_heat$Centroid.X,
                 y=usa_master_heat$Centroid.Y),
             data=usa_master_heat, col="red", size=1) +
  geom_density2d(data=usa_master_heat,
                 aes(x = usa_master_heat$Centroid.X,
                     y = usa_master_heat$Centroid.Y),
                 size = 0.3) +
  stat_density2d(data=usa_master_heat,
                 aes(x = usa_master_heat$Centroid.X,
                     y = usa_master_heat$Centroid.Y,
                     fill = ..level..,
                     alpha = ..level..),
                 size = 0.01, geom = "polygon") +
  scale_fill_gradient(low = "green", high = "red") +
  scale_alpha(range = c(0, 0.3), guide = FALSE)
```



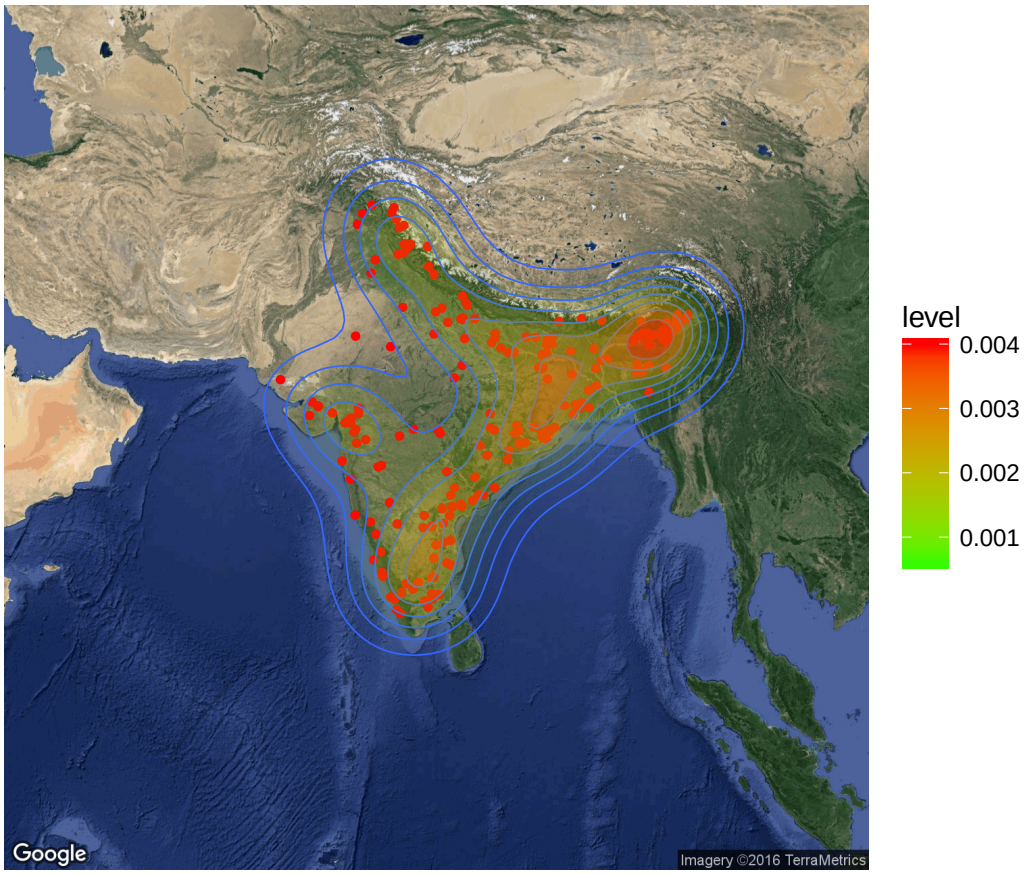

```
# information of China

## getting info of china
```

```
china_master = master_f[master_f$Country == "China", ]

## getting map of china
map_china <- get_map(location = "china", maptype = "satellite", zoom = 4)


## Showing which area had floods in the past
china_master_heat = data.frame(Centroid.X=as.numeric(china_master$Centroid.X),
                               Centroid.Y=as.numeric(china_master$Centroid.Y),
                               Total.floods.M.4=china_master$Total.floods.M.4)

ggmap(map_china, extent = "device") +
  geom_point(aes(x=china_master_heat$Centroid.X,
                 y=china_master_heat$Centroid.Y),
             data=china_master_heat, col="red", size=1) +
  geom_density2d(data=china_master_heat,
                 aes(x = china_master_heat$Centroid.X,
                     y = china_master_heat$Centroid.Y),
                 size = 0.3) +
  stat_density2d(data=china_master_heat,
                 aes(x = china_master_heat$Centroid.X,
                     y = china_master_heat$Centroid.Y,
                     fill = ..level..,
                     alpha = ..level..),
                 size = 0.01, geom = "polygon") +
  scale_fill_gradient(low = "green", high = "red") +
  scale_alpha(range = c(0, 0.3), guide = FALSE)
```




```
# information of India


## getting info of India
india_master = master_f[master_f$Country == "India", ]

## getting map of India
map_india <- get_map(location = "India", maptype = "satellite", zoom = 4)

## Showing which area had floods in the past
india_master_heat = data.frame(Centroid.X=as.numeric(india_master$Centroid.X),
                               Centroid.Y=as.numeric(india_master$Centroid.Y),
                               Total.floods.M.4=india_master$Total.floods.M.4)

ggmap(map_india, extent = "device") +
  geom_point(aes(x=india_master_heat$Centroid.X,
                 y=india_master_heat$Centroid.Y),
             data=india_master_heat, col="red", size=1) +
  geom_density2d(data=india_master_heat,
                 aes(x = india_master_heat$Centroid.X,
                     y = india_master_heat$Centroid.Y),
                 size = 0.3) +
  stat_density2d(data=india_master_heat,
                 aes(x = india_master_heat$Centroid.X,
                     y = india_master_heat$Centroid.Y,
                     fill = ..level..,
```

```
                    alpha = ..level..),
                size = 0.01, geom = "polygon") +
  scale_fill_gradient(low = "green", high = "red") +
  scale_alpha(range = c(0, 0.3), guide = FALSE)
```



TODO 3, plots of some days with a several occurrences and the pressure data

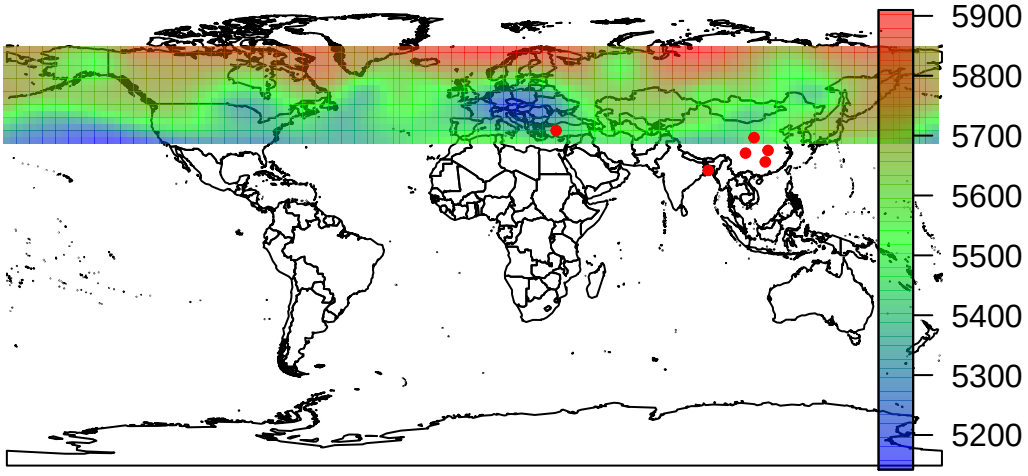
Xuyan

```
############################
#  Plots about NOAA Data #
############################

# Read geological data

library(RNetCDF)
noaa = open.nc('NOAA_Daily_phi_500mb.nc')
data = read.nc(noaa)

# flood data
master = read.csv("GlobalFloodsRecordMaster.csv", as.is = TRUE)
```

```r
stat = read.csv("GlobalFloodsRecordAnalyses.csv", as.is = TRUE)

master$Began = as.Date(master$Began,format = "%d-%b-%y")
master$Ended = as.Date(master$Ended,format = "%d-%b-%y")

# check the distribution of begin dates
library(dplyr)
date = data.frame(date = master$Began,cnt = 1)
group = group_by(date,date)
summ = summarise(group,cnt = n())
summ$date[summ$cnt == max(summ$cnt)-1]
```

```
## [1] "1998-05-20" "2002-06-12"
```

```r
# found that "1998-05-20" and "2002-06-12" is the most
maxDate = summ$date[summ$cnt == max(summ$cnt)-1][1]
phi3 = as.numeric(maxDate-as.Date("1948-01-01"))+1

xlon = data$X
ylat = rev(data$Y)
z = data$phi[,,phi3]

# find the data of the floods that day
floodDay = master[master$Began==maxDate & is.na(master$Began)==0,]

# set transparency
add.alpha = function(COLORS, ALPHA){
  if(missing(ALPHA)) stop("provide a value for alpha between 0 and 1")
  RGB = col2rgb(COLORS, alpha=TRUE)
  RGB[4,] = round(RGB[4,]*ALPHA)
  NEW.COLORS = rgb(RGB[1,], RGB[2,], RGB[3,], RGB[4,], maxColorValue = 255)
  return(NEW.COLORS)
}
pal = colorRampPalette(c(rgb(0,0,1), rgb(0,1,0), rgb(1,0,0)))
COLORS = add.alpha(pal(100), 0.6)

# map data
data(wrld_simpl)
plot(wrld_simpl)
image.plot(xlon-180,ylat,z,add=TRUE, col = COLORS)
points(floodDay$Centroid.X, floodDay$Centroid.Y, pch = 20, col = "red")
```



TODO 4, Countours of a certain flood within the NOAA data area

Hiro, Phoebe

TODO 5, PCA

Jordan